THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:-

1. A method of controlling the condition of a suspension of solid particles within a liquid including applying one or more stimuli to said suspension, said one or more stimuli adapted to control inter-particle forces between said solid particles, wherein each stimulus is selectively operable to effect conditioning between an initial state prevailing prior to said applying one or more stimuli and a conditioned state resultant from said applying one or more stimuli, thereby to control interaction between said solid particles within said liquid.

2. A method of controlling the consolidation of a bed of solid particles within a liquid including applying one or more stimuli to said bed, said one or more stimuli adapted to control inter-particle forces between said solid particles, wherein each stimulus is selectively operable to effect conditioning between an initial state prevailing prior to said applying one or more stimuli and a conditioned state resultant from said applying one or more stimuli, thereby to control interaction between said solid particles within said liquid, said stimulus being applied for a predetermined time thereby to liberate at least some liquid otherwise trapped within said bed.

3. A method according to claim 1 or claim 2 wherein said conditioning is reversibly operable.

4. A method according to claim 3 wherein said reversibly operable conditioning is facilitated by removal of said one or more stimuli.

5. A method according to claim 3 wherein said reversibly operable conditioning is facilitated by addition of another of said one or more stimuli.

6. A method according to claim 3 wherein said reversibly operable conditioning is facilitated by removal of said one or more stimuli and/or addition of another of said one or more stimuli.

7. A method according to claim 2 wherein said bed is a sediment bed, a filtercake, or the product of a centrifuge.

8. A method according to claim 1 or claim 2 wherein said conditioning is substantially by way of flocculation and/or coagulation.

9. A method according to any one of the preceding claims wherein said inter-particle forces may be attractive or repulsive between said solid particles within said liquid.

10. A method according to any one of the preceding claims wherein each of said one or more stimuli is applied for a predetermined time, thereby to induce the desired attraction or repulsion and subsequently removed or altered, thereby to effect said reversibility.

11. A method according to any one of the preceding claims wherein each of said one or more stimuli is a change in pH, temperature, wavelength of light or the absence thereof, chemical additive, or a combination thereof.

12. A method according to claim 11 wherein said stimulus is a change in pH.

13. A method according to claim 11 wherein said stimulus is a change in temperature.

14. A method according to claim 11 wherein said stimulus is a combination of change in pH and change in temperature, thereby to induce attractive or repulsive inter-particle forces, as desired.

15. A method according to claim 11 wherein said stimulus is by way of exposure to light, or the absence thereof.

16. A method according to claim 15 wherein said light includes wavelengths within the range of substantially ultraviolet to substantially visible.

17. A method according to claim 15 or claim 16 wherein said light stimulus is applied in combination with variations in pH and/or temperature.

18. A method according to claim 11 wherein said stimulus is provided by way of addition of one or more predetermined chemical additives.

19. A method according to claim 18 wherein said chemical additive is a single chemical capable of acting as flocculant or dispersant depending on the selection of predetermined process parameters.

20. A method according to claim 18 or claim 19 wherein said chemical additive is in the form of a photosensitive flocculant.

21. A method according to claim 16 wherein said chemical additive is a stimulus-sensitive polymer.

22. A method according to claim 21 wherein said stimulus-sensitive polymer is a polyelectrolyte.

23. A method according to claim 22 wherein said polyelectrolyte maybe cationic, anionic, non-ionic, or a combination thereof.

24. A method according to claim 22 or claim 23 wherein said polyelectrolyte is adsorbable onto the surface of said solid particles.

25. A method according to any one of claim 22 to claim 24 wherein said polyelectrolyte adsorbs onto said surface of said particle in a sufficient quantity as to create steric or electrostatic repulsion between said particles.

26. A method according to any one of claim 22 to claim 25 wherein said polyelectrolyte is substantially soluble at pH values where it is substantially charged, thereby to effect dispersion of said suspension.

27. A method according to any one of claim 22 to claim 26 wherein said polyelectrolyte is substantially insoluble at pH values where it is substantially uncharged, thereby to effect flocculation of said suspension.

28. A method according to any one of claim 22 to claim 27 wherein said polyelectrolyte is selected from the group consisting of chitosan, polyacrylic acid, polyacrylamides and derivatives thereof, polymethacrylic acid, poly sodium acrylate, polystyrene sulfanate, polysulfanamide, poly(2-vinyl pyridine), poly(vinylpyridinium bromide), poly(diallyldimethylammonium chloride)(DADMAC), poly(diethylamine), poly(epichlorohydrin), polymers of

quarternised dimethylaminoethyl acrylates, polymers of quarternised dimethylaminoethyl acrylamides, poly(ethyleneimine) and polyglucose amine.

29. A method according to any one of claim 22 to claim 27 wherein said polyelectrolyte is selected from the group consisting of homo- and copolymers prepared from ethylenic unsaturated monomers including methacrylic acid and salts thereof, methacrylamide, acrylamido methyl propyl sulfonic acid (AMPS) and/or styrene sulfanate and salts thereof.

30. A method according to any one of claim 22 to claim 27 wherein said polyelectrolyte is chitosan or polyacrylic acid.

31. A method according to any one of claim 22 to claim 27 wherein said polyelectrolyte is a polysaccharide.

32. A method according to claim 31 wherein said polysaccharide is selected from the group consisting of xanthan, carragenan, agarose, agar, pectin, guar gum, starches and alginic acid.

33. A method according to claim 31 wherein said polysaccharide is a derivatised polysaccharide selected from the group consisting of carboxy methyl cellulose and hydroxy propyl guar.

34. A method according to claim 21 wherein said polymer is temperature-sensitive.

35. A method according to claim 34 wherein said temperature sensitivity is such that said polymer is substantially soluble or substantially insoluble at substantially low temperatures.

36. A method according to claim 35 wherein said temperature sensitivity is such that said polymer is substantially insoluble (thereby to gel) or substantially soluble, at substantially high temperatures.

37. A method according to any one of claim 34 to claim 36 wherein said temperature sensitive polymer is a single polymer, or a combination of polymers.

38. A method according to any one of claim 34 to claim 37 wherein said temperature sensitive polymer is selected from the group consisting of poly(*N*-isopropylacrylamide) (poly(NIPAM)), co-polymers of poly(NIPAM) with other polymers such as polyacrylic acid, poly(dimethylaminopropylacrylamide) or poly(diallyldimethylammonium chloride) (DADMAC), polyethylene oxide, poly propylene oxide, methylcellulose, ethyl hydroxyethyl cellulose, carboxymethyl cellulose, hydrophobically modified ethyl hydroxyethl cellulose, poly dimethylacrylamide/*N*-4-phenylazophenylacrylamide (DMAAm) and poly dimethylacrylamide/ 4-phenylazophenylacryate (DMAA) and other related polymers, gelatine, agarose, amylase, agar, pectin, carragenan, xanthan gum, guar gum, locust bean gum, hyaluronate, dextran, starches and alginic acid.

39. A method according to any one of claim 34 to claim 37 wherein said temperature sensitive polymer is methylcellulose or poly(NIPAM).

40. A method according to claim 18 wherein said chemical additive is a photosensitive molecule wherein said photosensitivity is manifested in its solubility characteristics.

41. A method according to claim 40 wherein said photosensitive molecule is incorporated within one or more polymers.

42. A method according to claim 40 or claim 41 wherein at least one of said one or more polymers is a water soluble polymer.

43. A method according to any one of claim 40 to claim 42 wherein said polymers suitable for the inclusion of photosensitive units include polypeptides.

44. A method according to claim 43 wherein said polypeptides are selected from the group consisting of lysine and glutamic acid.

45. A method according to claim 40 or claim 41 where said polymer is selected from the group consisting of polyacrylamides, polysaccharides, polyelectrolytes and other water-soluble molecules.

46. A method according to claim 40 wherein said photosensitive units are spyropyrans and/or spyrooxazines.

47. A method according to claim 46 wherein said spyropyrans and/or spyrooxazines are selected from the group consisting of benzoindolino pyranospiran (BIPS), benzoindolino spyrooxazine (BISO), naphthalenoindolino spyrooxazine (NISO) and quinolinylindolino spyrooxazine (QISO).

48. A method according to claim 40 wherein said photosensitive units are azo benzene and similar groups, triphenyl methane derivatives and similar groups.

49. A method according to any one of claim 40 to claim 47 wherein said photosensitive molecule is triggered by a change in the wavelength of light from substantially visible to substantially ultraviolet.

50. A method according to claim 49 wherein said polymers responsive to said change in wavelength are selected from the group consisting of poly dimethylacrylamide/N-4-phenylazophenylacrylamide (DMAAm), poly dimethylacrylamide/ 4-phenylazophenylacryate (DMAA) and similar polymers.

51. A method according to claim 18 wherein said chemical additive is one or more copolymers added to said suspension.

52. A method according to claim 51 wherein component monomers within said copolymer may be dispersed randomly, alternately or in blocks.

53. A method according to claim 52 wherein said copolymer is a block copolymer.

54. A method according to claim 53 wherein said block copolymer is selected from the group consisting of AB blocks, ABA blocks, ABC blocks, comb, ladder, and star copolymers.

55. A method according to claim 52 or claim 53 wherein said block copolymer includes sectors that variously adsorb to said surface of said particles in suspension, and/or are sensitive to a stimulus.

56. A method according to claim 55 wherein said stimulus is one or more of change in pH, change in temperature, change in the wavelength of light, or the absence thereof.

57. A method according to any one of claim 53 to claim 56 wherein said copolymers are selected from the group consisting of polyethyleneoxide-polypropyleneoxide-polyethyleneoxide (PEO/PPO/PEO) triblock copolymers.

58. A method according to claim 57 wherein said PEO/PPO/PEO triblock copolymer is a Pluronics polymer.

59. A method according to any one of claim 53 to claim 58 wherein said copolymer includes one or more polypropylene oxide sectors, thereby to adsorb particularly to hydrophobic particles, and one or more polyethylene oxide sectors thereby to provide inter-particular steric repulsion at substantially room temperature.

60. A method according to any one of claim 53 to claim 59 wherein said copolymer(s) are comb copolymer(s), thereby having a backbone that enhances said surface adsorption, and teeth that are stimulus-sensitive.

61. A method according to claim 60 wherein said comb copolymer includes a polyacrylic acid backbone and polyethelyne oxide teeth.

62. A method according to claim 2 wherein removal of or a change in said stimulus provides for further settling/consolidation of said particles within said sediment bed.

63. A method according to claim 2 or claim 62 wherein said stimulus is a chemical additive, added to a suspension prior to formation of said sediment bed, thereby to effect substantially thorough mixing of said additive within said sediment bed.

64. A method of separating solid particles from a liquid including applying the method according to any one of the preceding claims, for a predetermined time thereby to provide a solids-rich phase and a liquids-rich phase and then separating said two phases.

65. A method according to any one of the preceding claims when used in conjunction with gravimetric thickening devices and/or tailings lagoons.

66. A method according to any one of claim 1 to claim 65 when applied to mineral slurries.

67. A method of controlling the dispersion of a suspension of solid particles within a liquid substantially as herein described with reference to any one of the embodiments of the invention illustrated in the accompanying drawings and/or examples.

68. A method for consolidating a sediment bed of solid particles within a liquid substantially as herein described with reference to any one of the embodiments of the invention illustrated in the accompanying drawings and/or examples.

69. A method of separating solid particles from a liquid substantially as herein described with reference to any one of the embodiments of the invention illustrated in the accompanying drawings and/or examples.